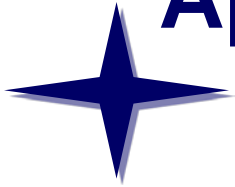


CCSDS USLP Activities

April 2016



Deutsches Zentrum für Luft- und
Raumfahrt e. V.



National Aeronautics and
Space Administration



Overview:



- ◆ The purpose is to discuss highlights regarding DLR and HOSC USLP activities over the last 6 months and focusing on CCSDS interoperability testing
- ◆ Two implementations
 - The USLP implementation from Stefan Veit at German Aerospace Center.
 - The USLP implementation from Kevan Moore at Marshall Space Flight Center.
- ◆ Prototype and Test team members
 - DLR - Stefan Veit at German Aerospace Center
 - NASA - Kevan Moore at Marshall Space Flight Center
- ◆ Additional support from the CCSDS USLP team as required

Overview:

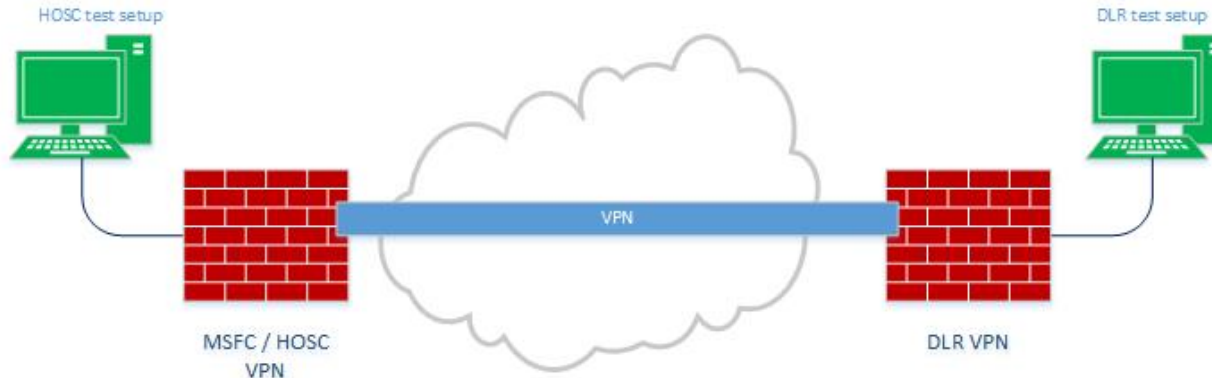


- ◆ Specification status
 - ◆ CCSDS 732.1-W-0 USLP July version of the White book was the initial spec
 - ◆ Basis for USLP work
 - Two independent implementations by two independent organizations
 - DLR and NASA/HOSC
 - Budgetary considerations affected late start-up for HOSC
- ◆ Current updating testing and prototyping based on
 - March 9th, 2016 document update
 - Comments and discussions from the ongoing USLP working group

Current Interoperability Testing

Overall test configuration:

- ◆ At least one node shall be established by each participant; DLR and NASA HOSC.
- ◆ Unique test stations at each end shall be established based on test conductors' particular setup.
- ◆ Two test conductors are required; one at MSFC/HOSC and one at DLR.
- ◆ Connections are protected by IPSEC VPN.



★ Current Interoperability Testing

- ◆ The HOSC took the lead to generate a preliminary test plan with basic configurations detailed by participants
 - ◆ DLR
 - ✦ Originally Based on July 20 White Paper, Now Based on March 9th 2016 White Book
 - ✦ SLES 12 with 64 bit
 - ✦ Implemented in C++
 - ◆ MSFC HOSC
 - ✦ Originally Based on July 20 White Paper, Now Based on March 9th 2016 White Book
 - ✦ Developed with MSFC Tech Excellence funding
 - ✦ Executing on SuperMicro/KVM virtual servers
 - ✦ Linux based on RHEL5.11 with 64 bit



★ Current Interoperability Testing

- ◆ Testing is at local and remote locations
- ◆ Test configuration use UDP/IP transfer of data is via IPSEC VPN to the remote tester using two methods
 - ◆ USLP frames can be sent between senders A and B or
 - ◆ Send A can send a UDP packet to Sender B
 - ✦ Sender B will incorporate the UDP packet into a USLP frame
 - ✦ Sender B will transfer the USLP frame back to Sender B
 - ✦ Sender B can test a variety of feature with Sender A without A reconfiguring



★ Outcome of Interoperability Testing

- ◆ Testing and prototyping has been an ongoing activity since late last year
- ◆ Initial testing entailed establishment of the VPN and continuity testing, ping
- ◆ Once the testing environment was established, testing conducted as needed to evaluate protocol development and is ongoing

Test cases

Test cases are repeated each from a both directions respectively in order to exercise source and destination nodes adequately.

1. Transfer Frame Header Only
2. Transfer Frame header and Transfer Frame Data Field
 - a. Data Field with minimum and maximum data octets with each Construction Rule
 - b. Spanning Packet Service with packets larger than the datazone
 - c. Data field with Extended Protocol ID and Isochronous Insert Zone
 - d. Data field and On-Demand Insert Zone
 - e. Data field and Security Header and Trailer
 - f. Data field and Operational Control field
 - g. Fixed length frames with encapsulation idle packets
 - h. Data field and Isochronous Insert Zone, Security Header/Trailer
 - i. Data field and On-Demand Insert Zone, Security Header/Trailer, and Operational Control Field
 - j. Data field and On-Demand Insert Zone, Security Header/Trailer, Operational Control Field, and Frame Error Control Field

Test cases

Test cases are repeated each from a both directions respectively in order to exercise source and destination nodes adequately.

1. Upcoming test activities

- a. Construction Rule 111 with several packets (needs to be discussed in the meeting)
- b. VC multiplexing
- c. MAP multiplexing (the most complex feature, will be tested at the very end hopefully)
- d. On-Demand Insert Zone (+Service) a late tested item
- e. Octet Stream (+Service) a late tested item



Test summary matrix



BACKUP



Abbreviations and Acronyms

| | |
|-------|---|
| CCSDS | Consultative Committee on Space Data Systems |
| DLR | Deutsches Zentrum für Luft- und Raumfahrt e. V. |
| HOSC | Huntsville Operations Support Center |
| ID | Identification |
| IPSEC | Internet Protocol Security |
| MAP | Multiplexer Access Points |
| MSFC | Marshall Space Flight Center |
| OCF | Operational Control Field |
| TFDF | Transfer Frame Data Field |
| USLP | Unified Space Link Protocol |
| VC | Virtual Channel |
| VPN | Virtual Private Network |